

HYDRO:EVOLVED

SOFT STARTER STARTUP MANUAL
SPRECHER + SCHUH
HYDRAULIC INSTALLATION

VERSION 1.0



SMARTRISE

Document History

Date	Version	Summary of Changes
January 30, 2021	1.0	Initial Submittal

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Sprecher + Schuh Soft Starter

The Sprecher + Schuh soft starter is used on hydraulic controllers.

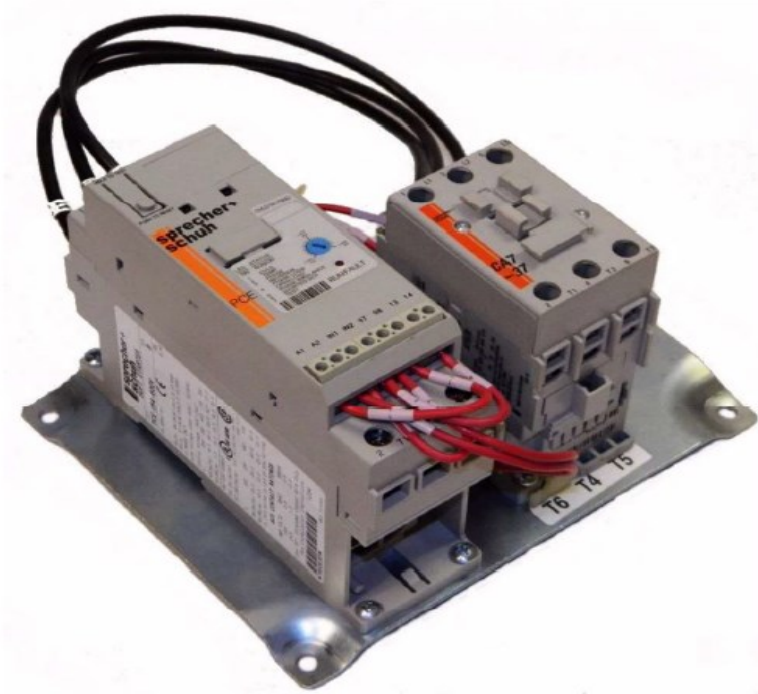


Figure 1: Sprecher + Schuh Soft Starter

Equipment/Settings Verification

Set and verify the equipment matches the job specific parameters for proper operation. See *Hydro:Evolved* sheet 3 Table for more information.

Job Specifications - Hydraulic													
Car	Group#	Group Car ID	Contract Speed	Floors	Capacity	Main Line Voltage	Motor Volts	Motor HP	Motor FLA	Minimum Drive AWG	Minimum Motor AWG	Disc. Size	starter
CAR1	Simplex	0	125	6	4000	240	240	50	130	2/0	3	175	PCEC-147-600V-120V

Car	Doors	DR Breaker Voltage	Valve Voltage
CAR1	2	220	120

Parameter	Value
Door Breaker Voltage	220
Valve Voltage	120
Main Line Volts	240
Motor Volts	240
Motor HP	50
Motor Amps	130

Figure 2: Example of Parameter Table

Grounding Requirements

NOTE: A proper and effective building ground connection is required for the safe and successful operation of the controller.

Examples of a proper building-to-controller ground are as follows:

1. Attach the ground wire to the street side of a water main.
2. Attach the ground wire to a grounding rod in the pit.

The controller has a common ground bus terminal connection.



Figure 3: Ground Bus Terminal

- The building, motor, transformer, and filter(s) must all share a common ground. This removes ground loops, limits impedance, and routes noise into the ground.

Wiring

A checklist must be completed during the soft starter wiring process. See Appendix 3 for terminal location.

Power

Perform the following to connect power. See Set and verify the equipment matches the job specific parameters for proper operation. See the *Hydro:Evolved* sheet 7 for job specific information.

- Connect main line power L1/L2/L3 to soft starter.
- Connect the ground wire to the green terminal screw on the soft starter mounting plate or ground bus terminal.

Valves Board

Perform the following to wire the valve solenoids:

1. Connect CL and CH from the Valve board to BN± on the MR board.
2. Connect NTS output from the MR board to NTS input on the Valve board.
3. Connect SAFE output from the MR board to SAFE input on the Valve board.
4. Connect Neutral from the valves to N on the Valve board.
5. Connect UPH, UPL, DNH, and DNL from the solenoids to the Valve board.

Motor/Soft Starter

Perform the following to connect the soft starter to the motor. See the *Hydro:Evolved* sheet 8 for job specific information. See Appendix 2 for additional DIP switch settings.

1. Connect SS fault input from Soft starter to 506 on the MR board.
2. Connect the Start Motor (SM) on the Valve board to the soft starter.

Perform the following for a 6-Lead Delta Wiring.

1. Connect the 6/12 -Lead motor lead to terminals T1/T2/T3 on the soft starter and T6/T4/T5 on the fault connector.
2. Open cover on top of soft starter and turn DIP 15 OFF.

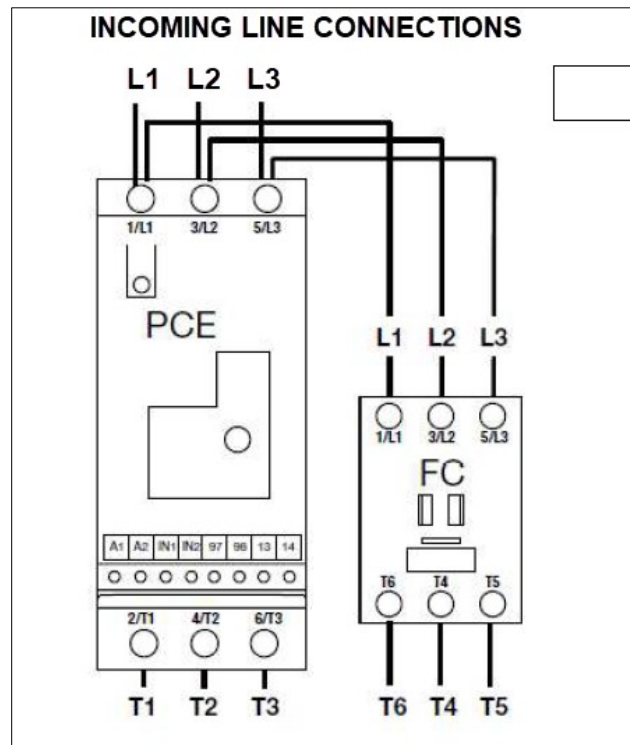


Figure 4: 6-Lead Delta Wiring Configuration

The table below lists the 6/12-Lead Delta Wiring.

Table 1: 6/12-Lead Delta Wiring

Terminals		T1	T2	T3	T4	T5	T6	Jump
Single Voltage	(208-575 VAC)	1	2	3	4	5	6	N/A
Dual Voltage	Low (220-240 VAC)	1,7	2,8	3,9	10,4	11,5	12,6	N/A
	High (460-480 VAC)	1	2	3	10	11	12	4 and 7 5 and 8 6 and 9

Perform the following for a 3-Lead Delta Wiring.

1. Connect the 3/9-Lead motor lead to terminals T1/T2/T3 on the fault contactor.
2. Open cover on top of soft starter and turn DIP 15 ON.

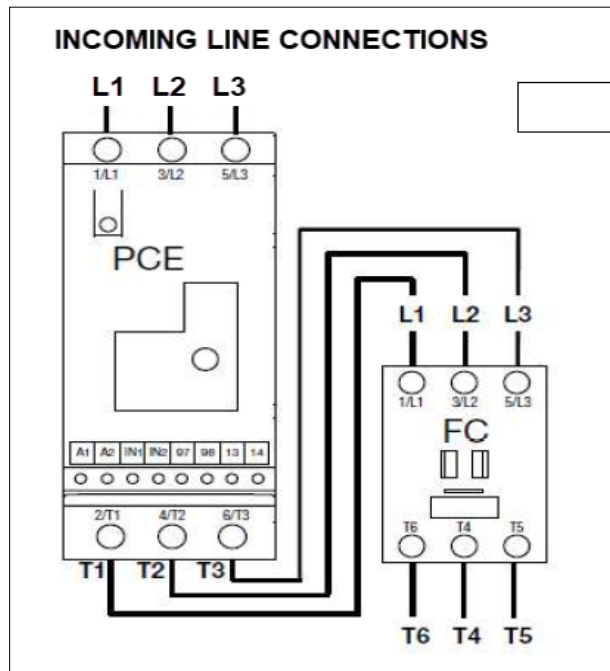


Figure 5: 3-Lead Line Wiring Configuration

The table below lists the 3/9-Lead Line Wiring.

Table 2: 3/9-Lead Line Wiring

Terminals		T6	T4	T5	Jump
3-Lead Motor	(208-575 VAC)	1	2	3	N/A
9-Lead Motor	Low (220-240 VAC)	1,6,7	2,4,8	3,5,9	N/A
	High (460-480 VAC)	1	2	3	4 and 7 5 and 8 6 and 9

Construction

All safety inputs are functional during Construction mode on the Hydro:Evolved controller. When these safety devices are installed, they are connected even if still on Construction mode. See page 5 for safety input connections. The following includes instructions for when none of these devices have been installed prior to beginning on Construction mode.

Perform the following to wire the Construction Box. See page 4 for the Construction Mode connections.

1. Turn off power to the controller.
2. On the MR board, connect a jumper from L120 to terminals LFT, LFM, and LFB.
3. Are there rear doors?
 - a. If there are rear doors, connect L120 to terminals LRT, LRM, and LRB. Go to step 4.
 - b. If there are no rear doors, go to step 4.
4. Connect a jumper from H120 to PIT, BUT, BFL, and TFL.
5. Connect a jumper from M120 to SFM and GOV.
6. Is a Run/Stop switch being used?
 - a. If a Run/Stop switch is used, go to step 7.
 - b. If a Run/Stop switch is not used, connect a jumper from H120 to SFH. Go to step 9.
7. Connect a wire from the MR board H120 to one side of the Construction Box Run/Stop switch.
8. Connect a wire from the MR Board SFH to the other side of the Construction Box Run/Stop switch.

NOTE: A closed switch indicates run and an open switch indicates stop.
9. Is the run box being used?
 - a. If the run box is being used, perform the following:
 - Connect the UP button to the input of the CUP.
 - Connect the DOWN button to the input of the CDN.
 - Connect the Enable to CEN (jump high if not available).
 - Power up the controller by turning on main power, pressing in all push breakers, and turning on the L1/L2 breaker.
 - Go to step 10.
 - b. If the run box is not being used, power up the controller by turning on main power, pressing in all push breakers, and turning on the L1/L2 breaker. Go to step 11.
10. Press the right button to access the Main Menu and navigate to Setup | Miscellaneous | Enable Const. Box to On. Scroll right and press Save.

NOTE: When the Enable Construction Box is On, the onboard inspection buttons are disabled.
11. Verify the Car Door Bypass and Hoistway Bypass switches are in the OFF position.
12. Place the INSPECTION switch to INSPECTION.
13. Verify the mode of operation is Construction.

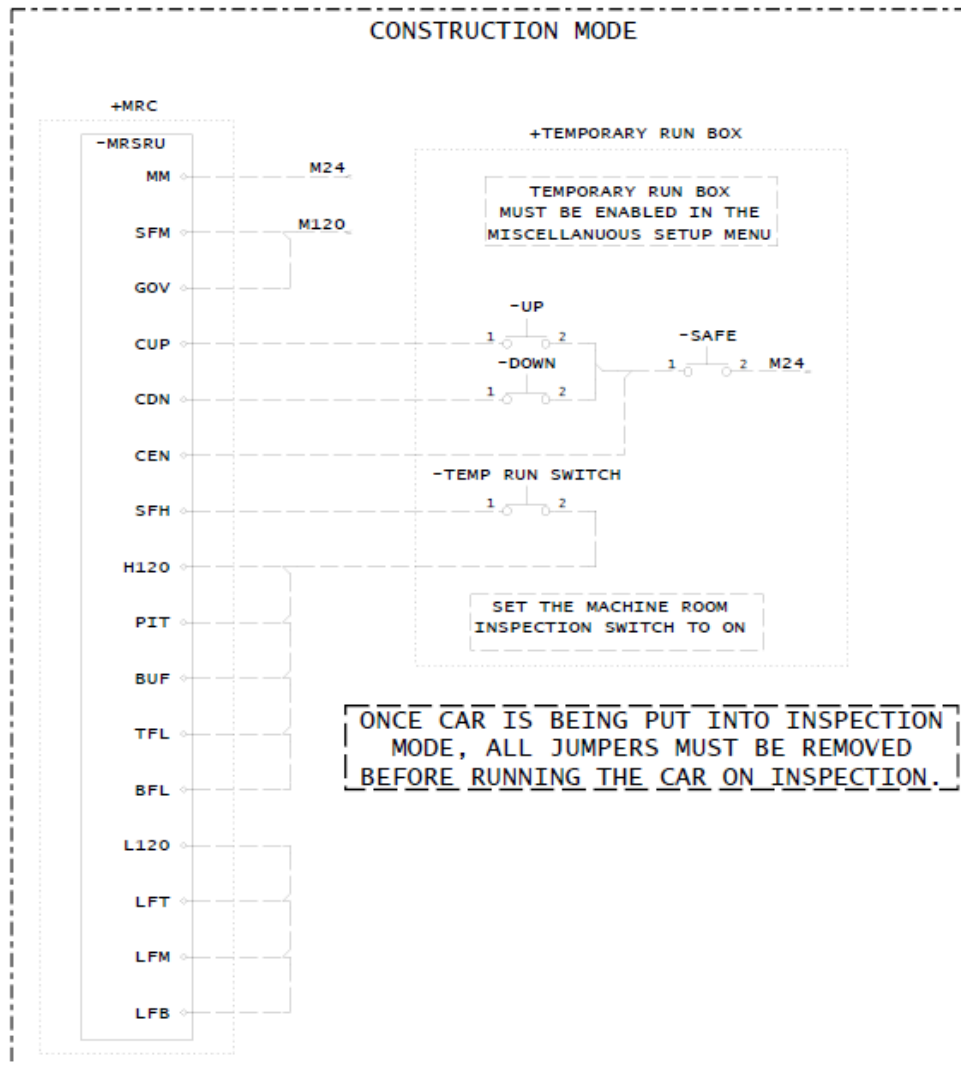


Figure 6: Example of Construction Wiring

Powering Up

Perform the following to power up the soft starter. Complete the checklist during the verification process.

1. Apply external power by closing the main disconnect.
2. Close the two-pole breaker and all pushbutton breakers.

3. Verify the LCD on the Smartrise board and the soft starter power up.

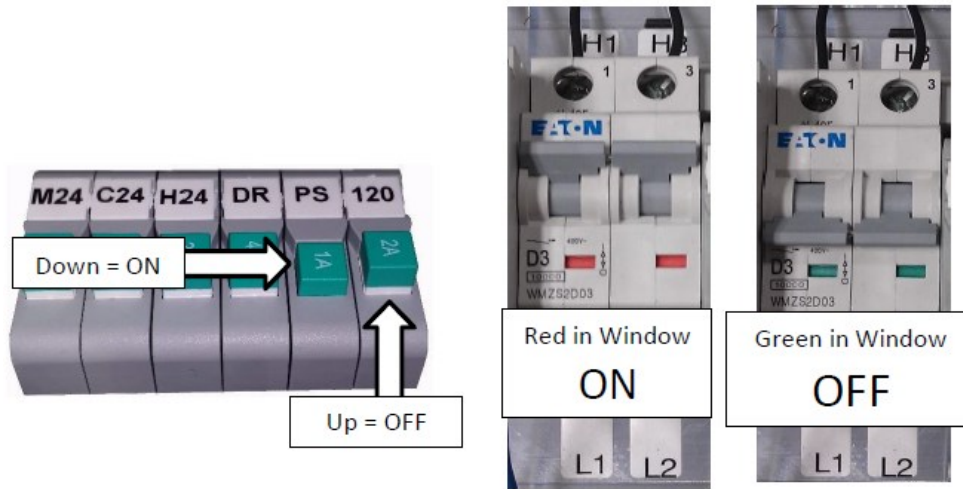


Figure 7: Breakers

Final Setup

Perform the following to set the Bypass Term Limit. Complete the checklist during the verification process.

NOTE: The selected menu within the menu options is shown with a *.

1. Toggle the Inspection/Normal switch to INSP position.
2. On the MR board, press the left arrow (ESC) button several times to get to the MAIN SCREEN.
3. Press the right button to access the Main Menu.
4. From the MAIN MENU, scroll and select Setup.



Figure 8: MAIN MENU – Setup

5. From the SETUP menu, scroll and select Miscellaneous.

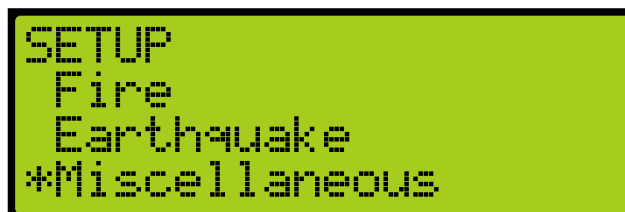


Figure 9: SETUP Menu – Miscellaneous

- From the MISCELLANEOUS menu, scroll and select Bypass Term Limits.

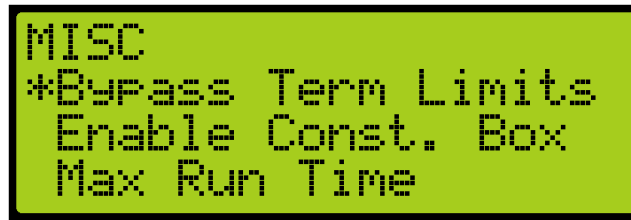


Figure 10: MISCELLANEOUS Menu – Bypass Term Limits

- From the BYPASS TERM LIMITS menu, set the BYPASS TERM LIMITS to ON.



Figure 11: Bypass Term Limits Menu

- Scroll right and press Save.
- Press the left button several times to get to the MAIN SCREEN.
- Verify the LCD displays Construction Mode on the MAIN SCREEN.

Operation

Run the car and complete the checklist during the verification process.

No Faults

Make sure the car is moving without triggering a fault either on the MR board or the soft starter. If the MR board displays a soft starter fault, look at the soft starter to see what the fault is. See Soft Starter Fault for troubleshooting faults.

Proper Direction

Make sure the car is moving in the same direction as the control switch on the Run Box. See Wrong Direction for troubleshooting proper direction faults.

At Speed

Make sure the car is moving in both directions and at the proper inspection speed. If the inspection speed is equal to contract speed the car should move at high speed. If the inspection speed is less than contract speed the car should move with leveling speed. See Car Not Moving or Too Slow for troubleshooting at speed faults.

Under Control

Make sure that the car is moving under full control. The car should stop when commanded from the Run Box. Verify that the car runs with no faults for 10 seconds or more. See No Control for troubleshooting under control faults.

Troubleshooting

The following sections list troubleshooting procedures.

Soft Starter Fault

If the Smartrise controller indicates a soft starter fault and the soft starter has the fault LED flashing, see Appendix 1 Sprecher + Schuh Troubleshooting Chart.

Wrong Direction

If the motor is running in the wrong direction, swap any two motor leads.

Car Not Moving or Too Slow

If the car is not moving or too slow perform the following:

- If the car does not move, verify that the valve relays are turning on when a direction is given (for example, UPL and SM for the Up direction and DNL for the Down direction).
- Measure the outputs to verify that the Valve board is working properly. If the proper voltages are present, check the wiring and the valves.
- Adjust the valves as required to get proper starts, stops, and run speeds.
- Verify the valve status by navigating to STATUS | VALVE 1 STATUS.

No Control

If there is no control perform the following:

- Verify the SFM and SFP relay are high when commanding the car to move.
- Verify the fault contactor is engaging when the car is commanded in either direction but the pump motor only comes on in the Up direction.
- Verify 120 VAC is present when the car is being commanded to run on the MR board for:
 - UPH
 - UPL
 - DNH
 - DNL

Appendix 1 Sprecher + Schuh Troubleshooting Chart

The table below lists troubleshooting solutions.

Table 3: Troubleshooting Solutions

Flashes	Fault Type	Possible Fault Explanations	Possible Solutions
1	Overload	<ul style="list-style-type: none"> Motor overload condition present. FLA dial adjustment not matched to motor. 	<ul style="list-style-type: none"> Check for motor overload condition. Verify actual motor current does not exceed FLA. Verify/Reset FLA dial adjustment. Program/modify Overload setting for load or duty cycle required.
2	Over Temperature	<ul style="list-style-type: none"> Controller ventilation blocked. Controller duty cycle exceeded. Colling fan not working. Ambient temperature exceeded. Failed Control module. Over-current condition with Overload disabled. 	<ul style="list-style-type: none"> Check for proper ventilation. Verify duty cycle. Connect or replace cooling fan. Wait for controller to cool or provide external cooling. Replace control module.
3	Phase Reversal	<ul style="list-style-type: none"> Incoming supply voltage is not the expected sequence of either ABC or CBA 	<ul style="list-style-type: none"> Check power wiring, Change two of the incoming phases and verify that the motor is spinning in the correct direction. If the motor does not turn in the correct direction, change the incoming phases back to their original connections and change DIP switch #9 to the desired Line Rotation sequence setting.
4	Phase Loss/ Open Load	<ul style="list-style-type: none"> Missing Supply Phase Missing or unable to detect motor connection 	<ul style="list-style-type: none"> Check that the fault contactor is closing. If not, verify that the safety string is closed or jumped out. Check for open line (for example, open fuse), Check for incorrect wiring to load, Verify proper operation of the fault, Contactors, Verify connection type to motor (LINE or DELTA), Ensure product is sized correctly for motor.

Flashes	Fault Type	Possible Fault Explanations	Possible Solutions
5	Phase Imbalance	<ul style="list-style-type: none"> Unbalanced Phase Currents (> 65% differential) Incoming line voltage problem 	<ul style="list-style-type: none"> Check motor current in each phase to verify imbalance. Motor current imbalance can indicate potential motor problems
6	Shorted SCR	<ul style="list-style-type: none"> Shorted SCR Welded or latched Bypass contactor 	<ul style="list-style-type: none"> Verify connection type (LINE or DELTA) and verify setting. Perform continuity check across power poles (L1-T1, L2 -T2, L3 -T3) Measurements should exceed 10 kΩ. For best results, remove line and load motor connections. Cycle power to device and attempt to restart. If fault persists replace device.
7	Test	<ul style="list-style-type: none"> Intended operation 	<ul style="list-style-type: none"> Reset Fault.
12	Checksum	<ul style="list-style-type: none"> Internal Software computation 	<ul style="list-style-type: none"> Replace Device.

Appendix 2 Sprecher + Schuh PCE Soft Start DIP Switch Settings

The PCE elevator controller is programmed through DIP switches located on the front of the controller. **Default settings are indicated by shaded areas.**

Start Time

The start time defines the time the controller will ramp or limit current to the motor. The controller can determine when the motor is up to speed. Therefore, it may transition to bypass before this time expires. If the motor does not reach speed before the time expires, the controller will continue under SCR control and not close the bypass contactor.

The table below lists the start time.

Table 4: Start Time

Setting (Seconds)	DIP Switch 1	DIP Switch 2	DIP Switch 8
2	OFF	OFF	OFF
5	ON	OFF	OFF
10	OFF	ON	OFF
15	ON	ON	OFF

Start Mode

In Current Limit mode, a set level of current is applied to the motor over the start time. In Soft Start mode, the device will ramp the torque from the initial level to 100% over the start time.

The table below lists the start mode.

Table 5: Start Mode

Mode Setting	DIP Switch 3
CURRENT LIMIT	OFF
SOFT START	ON

Current Limit/Initial Torque Level

The current limit/initial torque level defines the time the controller will ramp or limit current to the motor. The controller can determine when to bypass before this time expires. If the motor does not reach speed before the time expires, the controller will continue under SCR control and not close the bypass contactor.

The table below lists the current limit/initial torque level.

Table 6: Current Limit/Initial Torque Level

%FLA / %Torque	DIP Switch 4	DIP Switch 5
150% / 15%	OFF	OFF
250% / 25%	ON	OFF
350% / 35%	OFF	ON
450% / 65%	ON	ON

Soft Start Time

Soft Stop reduces the voltage applied to the motor over the programmed period of time. The soft stop is complete when the soft stop timer has expired or the current measured drops below 50% of the FLA setting.

The table below lists the Soft Start time.

Table 7: Soft Start Time

Setting (Seconds)	DIP Switch 6	DIP Switch 7
OFF	OFF	OFF
1 X START TIME	ON	OFF
2 X START TIME	OFF	ON
3 X START TIME	ON	ON

Phase Rotation

The phase rotation is the allowable phase rotation of the motor defined by this switch.

The table below lists the phase rotation.

Table 8: Phase Rotation

Setting	DIP Switch 9
ABC ROTATION	OFF
CBA ROTATION	ON

Phase Imbalance

The controller has the ability to monitor for imbalance between phase currents. This protection feature can be user disabled.

The table below lists the phase imbalance.

Table 9: Phase Imbalance

Setting	DIP Switch 10
ENABLED	OFF
DISABLED	ON

Overload Trip Class

The controller incorporates, as standard, electronic overload protection. This motor overload protection is accomplished electronically with the use of internal current transformers on each of the three phases. The controllers overload protection is programmable providing the user with flexibility.

The table below lists the overload trip class.

Table 10: Overload Trip Class

Setting	DIP Switch 11	DIP Switch 12
OFF	OFF	OFF
10	ON	OFF
15	OFF	ON
20	ON	ON

Overload Reset

In manual reset mode, the fault can only be reset by pushing the 'push to reset' button on the front of the controller. In auto reset mode, the unit will automatically reset when the unit determines the motor has cooled to 75% of its thermal capacity.

The table below lists the overload reset.

Table 11: Overload Reset

Setting	DIP Switch 13
MANUAL	OFF
AUTO	ON

AUX#1 Setting

The operation defines the operation of the auxiliary contacts. Normal mode means that the contact will change state immediately when a start/run command is given. Up-to-Speed mode means that the contact will change state only when the controller is in bypass. Aux#2, when added, will operate opposite of this programming.

The table below lists the Aux#1 setting.

Table 12: Aux#1 Setting

Setting	DIP Switch 14
NORMAL	OFF
UP TO SPEED	ON

Motor Connection Type

In DELTA connection mode, the device is designed to control a 6 or 12 lead motor. In LINE connection mode, the device is designed to control a 3 or 9 lead motor.

The table below lists the motor connection type.

Table 13: Motor Connection Type

Setting	DIP Switch 15
DELTA	OFF
LINE	ON

Stop Delay

When the delay is programmed, the motor will continue to run for the programmed period of time after the run command is removed from the controller.

The table below lists the stop delay.

Table 14: Stop Delay

Setting (Seconds)	DIP Switch 15
0.0	OFF
0.75	ON

Appendix 3 Terminal Locations

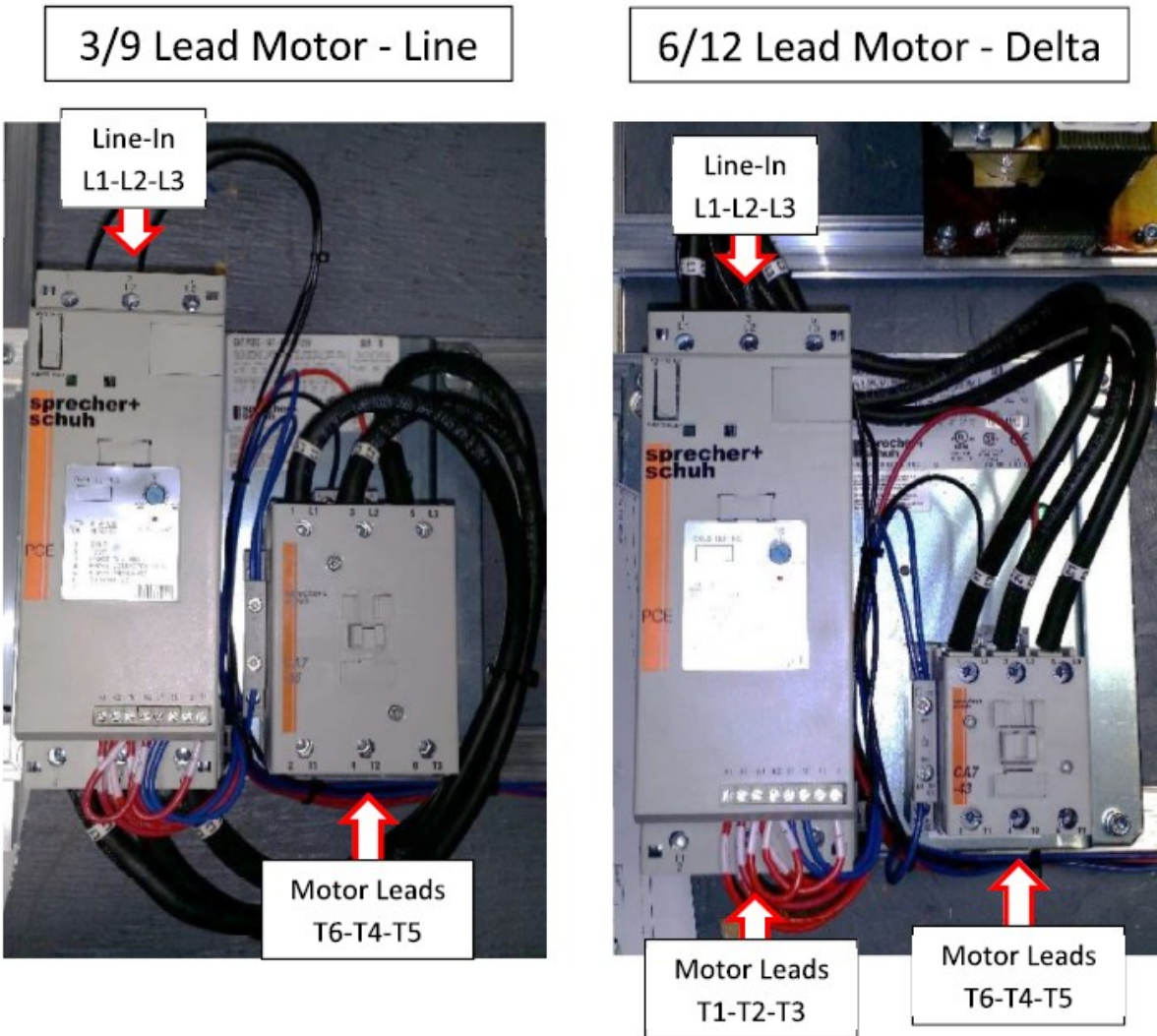


Figure 12: Terminal Locations